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Question Paper Code : 21445

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Third Semester

Electronics and Communication Engineering

EC 2204/EC 35/EC 1202 A/080290015/10144 EC 305 — SIGNALS AND SYSTEMS

(Common to Biomedical Engineering)

(Regulations 2008/2010)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Given $x(n) = \{1, 2, \underset{\uparrow}{3}, -4, 6\}$ Plot the signal $x[n-1]$.

2. Define power signal.

3. Define Fourier transform pair for continuous time signal.

4. Find the Laplace transform of an unit step function.

5. State the condition for LTI system to be causal and stable.

6. Differentiate between natural response and forced response.

7. Define Z — transform.

8. State the relation between DTFT and Z — transform.

9. List the four steps used to obtain convolution.

10. What is state transition matrix?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Given $y[n]=n\,x[n]$. Determine whether the system is memoryless, causal, linear and time invariant. (8)

(ii) Describe the classification of systems. (8)

Or

(b) (i) Compute the linear convolution of $x[n]=\{\underset{\uparrow}{1},1,0,1,1\}$ and $h[n]=\{\underset{\uparrow}{1},-2,-3,4\}$. (8)

(ii) Distinguish between random and deterministic signals. (8)

12. (a) (i) Find the Laplace transform of $X(s)=\dfrac{1}{(s+1)(s+2)}$. (8)

(ii) State and prove the Parseval's relation for continuous time signals using Fourier transform. (8)

Or

(b) (i) State and prove any two properties of continuous time Fourier transform. (8)

(ii) Determine the Fourier series representation for $x(t)=2\sin(2\pi t-3)+\sin(6\pi t)$. (8)

13. (a) Find the natural response of the system described by the difference equation $\dfrac{d^2y(t)}{dt^2}+6\dfrac{dy(t)}{dt}+8y(t)=\dfrac{dx(t)}{dt}+2x(t)$. The initial conditions are $y(0+)=2;\dfrac{dy(0+)}{dt}=3$. (16)

Or

(b) Derive the expression for convolution integral. Explain any three properties of convolution integral in detail. (16)

14. (a) (i) Compute DTFT of a sequence $x[n]=(n-1)x[n]$. Use DTFT properties. (8)

(ii) Find the discrete time Fourier transform of $x[n]=[1/2]^{n-1}u[n-1]$. (8)

Or

(b) State and prove the properties of z — transform. (16)

15. (a) State and prove the properties of discrete Fourier transform. (16)

Or

(b) (i) Find the DFT of the signal $x[n] = \begin{cases} 1, & 0 \le n \le L-1 \\ 0, & \text{otherwise} \end{cases}$. (8)

(ii) Find the six point DFT of $x[n] = \{1, 1, 1, 0, 0, 1\}$. (8)
